7.1 Activity – Theoretical and Empirical Probability Name: _____

Part 1 – Comparing Theoretical and Empirical Probabilities

You will receive one die to roll and one penny to toss. Follow the directions below:

1. Calculate the theoretical probability for a coin to land on heads or tails, respectively.
   a. What is the theoretical probability of flipping heads (H)? Tails (T)?

      H: T:

   b. Is this a classical or empirical probability? Why

   c. Out of the 10 tosses, how often do you expect to get heads? Tails?

      H: T:

2. Toss the coin 10 times. After each toss, record if you got heads or tails in the table.

   a. Calculate the probability of each event based on your data.

   H: T:

   b. Is this a classical or empirical probability? Why

   c. Do your results match your expectations from #1c?

3. Compare your results from #2a to other members in your group.
   a. Are the results the same? Should you expect the same results? Why or why not?

4. Combine your results from the coin flips in #2 with your group members.
   a. Calculate the overall probability of heads and tails using all members' results.

      H: T:

   b. How are they different from the previous results of your 10 coin tosses (#2a)?

   c. Does your experimental probability (#4a) match your theoretical probability (#1a)?

5. Calculate the theoretical probability for rolling each number on a six-sided die.
   a. What is the theoretical probability for each number?

      1: 2: 3: 4: 5: 6:

   b. Out of the 10 rolls, how often do you expect to get each number?

      1: 2: 3: 4: 5: 6:

6. Take the die and roll it 10 times. After each roll, record which number you got in the table.

   a. After 10 rolls, write your results in fraction or decimal form, as you did for #2a.

      1: 2: 3: 4: 5: 6:

   b. Compare your results with your predictions in #5b. How close are they?

7. Compare your results from #6a to other members in your group.

   a. Are the results the same? Should you expect the same results? Why or why not?

8. Combine your results from the die rolls with your group members.
   a. Calculate the overall probability of each number using all members' results.

      1: 2: 3: 4: 5: 6:

   a. How are they different from your previous result for the 10 die rolls in #6?

   b. Does your experimental probability match your theoretical probability?

9. Compare the theoretical calculated probability numbers with your actual data for both activities (coin and dice). What do your combined results tell you about theoretical versus empirical probability?

Part 2 – Sample Space and Probability

Colors	Red	Orange	Yellow	Green	Brown	Total
Quantity	75	84	55	62	91	
Probability						

10. Fill in the table then answer the following questions:

a. If you draw one M&M, what is the probability that it is yellow?

b. If you draw one M&M, what is the probability that it is not yellow?

c. If you draw one M&M, what is the probability that it is orange or brown?

d. If you draw one M&M, what is the probability that it is orange and brown?

e. If you draw one M&M, what is the probability that it is neither green nor brown?